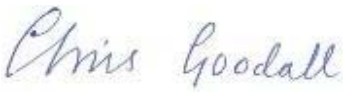
Carbon Commentary Newsletter #4

A critical appraisal of issues in the move to a low-carbon economy

Monday 29 October 2007

This edition of Carbon Commentary examines the impact of the growing trade deficit with China on the underlying emissions of the UK economy and looks at how the virtuous Innocent smoothie company made an error with its apparently eco-friendly packaging. Other pieces include an analysis of why video conferencing may be starting to replace travel at long last and why Peak Oil isn't going to save us. An article looks at why food waste is a much bigger climate change issue than food packaging. A final section looks in brief at some of the main climate change news stories of the last two weeks.

As always, I am very grateful for any comments. Please circulate this newsletter to anybody you think might be interested.



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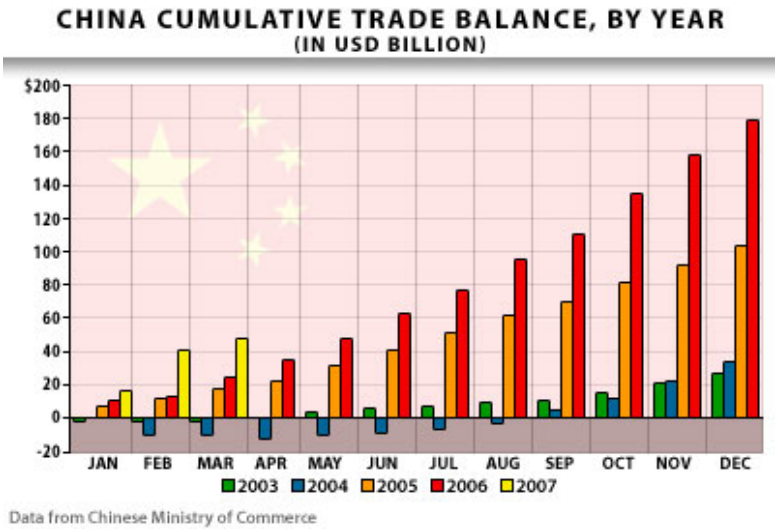
Chris Goodall's book *How to Live a Low-Carbon Life* won the September 2007 Clarion prize for non-fiction.

Articles in this edition

China is keeping the UK within the Kyoto limits



Post-industrial countries like the UK import an increasing fraction of their manufactured goods from China. The

carbon emissions from the Chinese factories making these goods are not included in the UK's totals. How much greater would the UK's emissions be if we included the impact of goods manufactured in China?

In this article, we make some estimates based on a briefing note recently produced by the Tyndall Centre. The numbers I use are imprecise – and I am using them for reasons not envisaged by Tyndall – but I believe that the increase in the imports of Chinese goods has probably reduced UK emissions by about 6% below what it would have been. Perhaps more dramatically, the trade deficit is rising so fast that it is depressing UK emissions by a further 2% a year.

Without the safety valve of Chinese imports, the UK would be very likely to breach its Kyoto targets, which only measure domestic emissions. This is important in itself, but a more striking conclusion is that the trade with China has disguised a failure to cut emissions growth below the growth of British GDP. The UK government, and others around the world, regularly claim that CO2 output has been 'decoupled' from economic growth. The analysis contained in this note suggests that the apparent decoupling is actually an artefact of the growing deficit in trade with China.

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When a country imports goods or services, the emissions are carried on the account of the exported country. International trade shifts the location of greenhouse gas emissions.

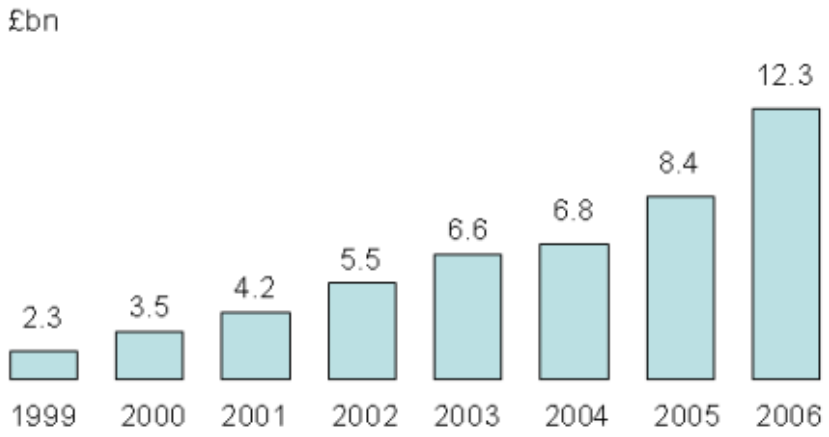
Most rich countries are now sourcing a large fraction of their manufactured goods from Asia. The shift to China and other countries is tending to reduce European and American emissions and increase those of Asia.

The Tyndall Centre recently produced a briefing note which concluded that the enormous Chinese trade surplus was responsible for about 1,100m tonnes of greenhouse gases in 2004. This is about 4% of the world total. Put another way, China's trading partners would have greenhouse gas emissions figures 4% higher if they included the carbon 'embedded' in the goods that they bought. As the China trade surplus increases, the percentage of the developed world's emissions that are being transferred to the east is growing every year.

The impact on the UK carbon emissions account

The UK runs a large and rapidly increasing trade deficit with China. The figures for the last eight years are shown in the chart below. The most recent numbers suggest that the deficit may rise to over $16bn this year.

The UK's trade deficit with China



Let's take the numbers for 2006. A £12.3bn net deficit (exports of about £3bn and imports of about £15bn) is equivalent to about 1% of UK GDP. If the trade were typical of the UK economy as a whole, having £12.3bn of economic activity in another country would therefore have reduced UK emissions by about 5m tonnes.

But the material we import from China isn't typical of the UK economy. It is heavily concentrated on manufactured goods, which will usually have a very much higher carbon footprint than the economy as a whole. By moving our manufacturing to China, we are having an impact on emissions far greater than the share of Chinese imports in our economy.

There is also a second effect. Chinese energy efficiency is much lower than in the West. It takes far more electricity or coal to manufacture Chinese goods than it does in the UK. If we stop making something in the UK and transfer production to China we will add to the total emissions produced by the manufacturing process, increasing global emissions. Of course this will change as China improves its factories but at the moment the country uses about twice as much energy as Western nations per unit of output. We cannot be absolutely certain about this figure but the

Chinese steel industry acknowledges that it uses twice the energy to make a tonne of steel as a typical Western plant. The International Energy Agency produces an estimate that similarly suggests that a dollar of Chinese GDP produces twice as much carbon dioxide as in the UK.

We can use the Tyndall Centre figures to estimate the impact of using Chinese factories to make our manufactured goods, though with a substantial range of uncertainty. Tyndall looked at the makeup of Chinese exports and estimated the typical greenhouse gas intensity of the major categories, such as machinery or textiles. The work isn't precise and the researchers don't pretend otherwise. But the conclusions seem reasonable and so I use their raw numbers to make estimates of the impact on the UK.

In 2004, was China responsible for about 5m tonnes of greenhouse gases per £1bn of exports. Imports into China from the rest of the world were much less energy intensive and the Tyndall researchers suggest that £1bn of imports were produced with only 1.35m tonnes of carbon dioxide equivalent.

The impact on Chinese emissions from its trade with the UK*

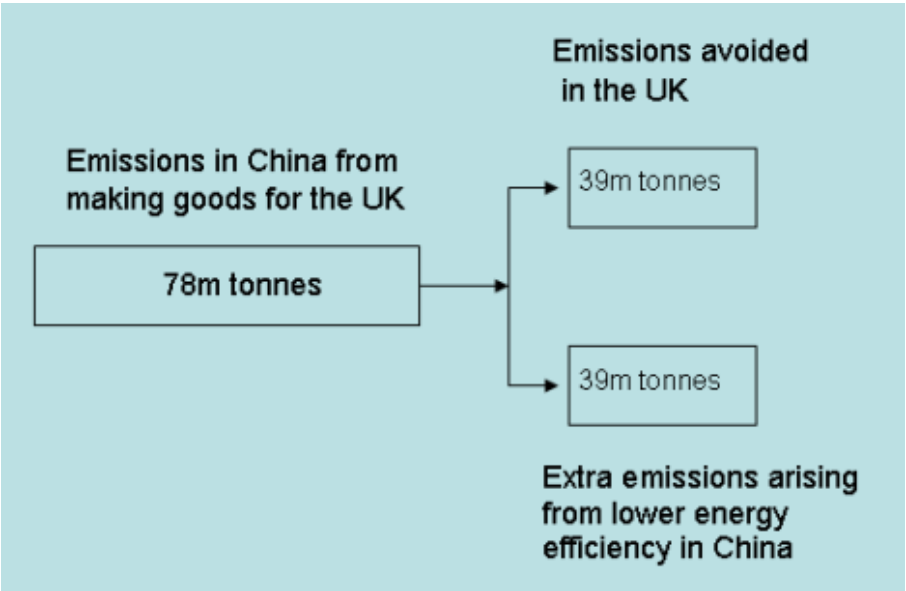
	Million tonnes of CO2 per £1bn of trade	Value of trade 2006 £bn	Total associated greenhouse gases (m tonnes CO2)
Chinese imports from UK	1.35	3.3	4.5
Chinese exports to UK	5.0	15.6	78.2
Net figure for Chinese trade surplus with the UK		12.3	73.7

* Assumes £1 = $2.

So the 2006 trade between the two countries resulted in emissions of approximately 78m tonnes in China and 5m tonnes in the UK giving a net balance of almost 74m tonnes, or about 12% of UK emissions.

But if the Chinese goods had been made in the UK, they wouldn't have been accompanied by 78m tonnes of CO2. If Chinese energy efficiency is about half the UK's, then the cost would have been about 39m tonnes, about 6% of the national total.

Broadly speaking, the net impact of 2006 trade between the two countries is as follows:



Buying from China reduced UK emissions in 2006 by about 39m tonnes. This is about 6% of today's greenhouse gas emissions. Final figures for 2006 have not been released, but the country is currently about 2.5-3% below its Kyoto target. I think we can be reasonably confident that the increasing trade deficit with China, which has risen from about £2bn in 1999 to over £12bn in 2006, has kept the UK from breaching its Kyoto obligations.

The deficit with China is growing at about £4bn each year. According to the figures above, the likely impact of this is

to reduce UK emissions by nearly an additional 2% a year. Even without this effect, the UK's emissions are edging upwards. If we included our extra trade with China, we would be seeing a rate of emissions growth very similar to the UK's GNP growth rate. This forces us to face a serious issue: we have simply not yet decoupled GDP growth from CO2 output. Our use of energy is growing as fast as national income. The growth is disguised by the burgeoning trade deficit with China.

Taking risks with the brand

The Goodall household is well-trained. Compostable products get put on the compost heap. Plastic bottles end up in the recycling bin. Where should Innocent's new smoothie bottles made from bio-degradable corn starch go? Surprisingly, the answer is into landfill.

Innocent, the company with one of the purest brands in the UK, has made a mistake. For the last year it has used a new material called PLA for one of its ranges of drinks. It admitted last week that it would cease to use this bio-plastic later this year. But on its website it was still making some surprising claims. It says that the bottles made from this bio-plastic break down in garden compost heaps. They will not. PLA needs to be heated for several days to temperatures far greater than those in a domestic compost bin before it begins to rot. The bottles would break down in a commercial composter, but very few local authorities operate one of these plants. Innocent's ethical consumers are going to find a large number of plastic bottles at the bottom of their compost heap next spring.

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The company says that in households without compost bins the bottles should be recycled along with other plastics. Unfortunately, this is another mistake. Recycling companies need to separate the different types of plastics so that reprocessing companies can melt them down and recreate the original plastic for re-use. Innocent's PLA bottle looks and feels like a conventional soft drink container made from a plastic called PET. An Innocent bottle dropped into the plastic recycling box at home will eventually be sorted into a batch with Coca-Cola bottles made from the ubiquitous PET. The PLA will contaminate the batch, and may result in the reprocessor being unable to sell the plastic. PLA comes from the US, and recycling companies there have persuaded the bottling industry not to use the corn-based material in order to maintain the purity of recycled PET.

Innocent has also mistakenly said that the new plastic is 'carbon neutral'. The plastic manufacturer does indeed stress that its product has a small carbon footprint compared to a conventional oil-based plastic. NatureWorks, the company that makes PLA in the heart of the corn belt, buys all its electricity from wind farms. However the company certainly does not claim that the farms that grow corn avoid the use of fossil fuels. Growing corn needs large amounts of fossil fuel-based fertiliser. Farmers use diesel fuel to run their tractors and ship the grain to the factory. Greenhouse gas emissions from producing corn are substantial. Innocent didn't look carefully enough at the manufacturer's slightly ambiguous claims on this issue. A boast that a product is 'carbon neutral' is rarely true and perhaps Innocent should have been much more sceptical before it made its own claims.

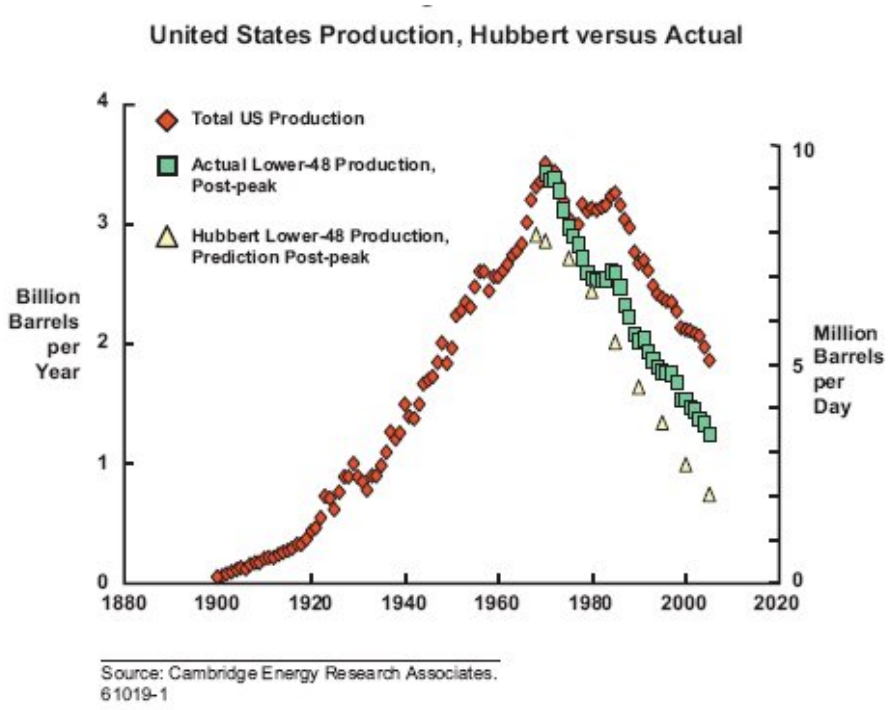
No one doubts Innocent's genuine commitment to running its business to the highest ethical standards. It was one of the first companies to decide not to ship its ingredients by air. The company's ethical sourcing principles are an example to others. 10% of its profits go back to charities in countries where its fruits come from. It has even tested the idea of putting a carbon label on one of its premium products. Its pristine brand image is one of the reasons why it can charge a king's ransom for a litre of pulped fruit.

Using PLA for its bottles will have seemed an excellent way of keeping ahead of its competitors. Innovation is always risky, and no one can blame Innocent for its enthusiasm in experimenting with a new plastic being aggressively sold by its American manufacturer. It has only ever used PLA in a small fraction of its ever-expanding range of colourful drinks and the damage to its brand will be very limited. Nevertheless, it will make consumers a little bit more wary of trusting Innocent's claims. A reputation for taking green issues seriously is increasingly valuable. Once lost, ethical credentials will be costly to rebuild.

There is another strange thing about Innocent's use of PLA: it is made from genetically modified corn. None of us are privy to Innocent's market research, but I would guess that its most devoted customers are anxious middle-class mums trying to get their children to eat more fruit. In my experience, people like this have a strong visceral distrust of GM foods. Why did Innocent decide to put its ethically sourced and highly nutritious foods in a container made from a substance its customers would strongly reject? And why did the company decide not to tell shoppers of its

decision? For a business like Innocent, the green ethic has to run through everything it does and for once its high standards slipped.

Peak Oil



The Peak Oil question is beginning to become a central part of the daily debate on energy matters. On one side is an increasing number of independent scientists and oil engineers who note that world oil production is barely rising. Existing fields are running down and new reserves are found rarely. On the other side of the debate are the major institutions of the global oil industry. The International Energy Agency sees world oil supply rising from about 88 million barrels a day now to about 116 million barrels in 2030.

This last week saw another analysis (from Germany's Energy Watch Group) suggesting that world oil production actually peaked in 2006. From now on, the group says, we can expect rapid declines. Many people worried about climate change see Peak Oil as a good thing. They believe that a shortage of oil and natural gas will slow down the rise in energy consumption and therefore help reduce greenhouse gas emissions.

The argument is actually more complex – it may well be that Peak Oil will tend to increase CO2. We will not be saved from ourselves by running out of oil.

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The Peak Oil debate
First, some facts that nobody disagrees with:

- A large part, perhaps a majority, of the recoverable oil in the Earth's crust has already been extracted. The CTO of Chevron, a company not known for its pessimistic utterances, particularly about oil supply and climate change, recently said that we have used 1.1 trillion gallons and only a further 1 trillion could be extracted with current technologies.
- Most large oil deposits have already been found. We probably will never see a new field the size of the main Saudi Arabian field. Today's discoveries are smaller, usually very much smaller. It is taking more and more exploration effort to find fewer and fewer fields.
- The world oil industry is finding it more and more difficult to maintain this growing exploration drive. Oil drilling equipment is in short supply (and one drilling rig is typically likely to find far fewer barrels a year than it did twenty years ago). Oil engineers have an average age of 51 and few people are being trained to replace them.
- The growth in the expenditure on oil exploration is largely 'illusory' (source: IEA). More money is being spent, but it is being consumed by rapid cost inflation and the need to work in ever more arduous environments.
- We are consuming more than we are discovering.

- Any future production increases will have to be concentrated in the OPEC countries or Russia. No other oil provinces are likely to produce substantial amounts of new oil. Everybody agrees that non-OPEC oil provinces are already in decline.
- The oil companies have been able to maintain an apparent stability in the volume of unused world reserves by upgrading their estimate of extractable oil each year, not from new discoveries.

The key differences between the Peak Oil proponents and the sober institutions of the world energy industry are few but stark:

- Peak Oil people say that Saudi Arabia is pumping almost as much as it can. Optimists like the IEA say it can continue to grow its output for several decades. Of the 28m extra barrels of oil a day that IEA projects for 2030, over 8m comes from the Kingdom.
- Both sides make similar remarks about Iran, Venezuela, Iraq and Russia. The pessimists say that these countries aren't discovering oil and their main fields are near decline. The mainstream forecasters say that they can grow.
- Around the world there are huge resources of low-grade oil in the form of shale or sands. The most important may be in Canada. Peak Oil people say that these resources are extremely costly to exploit and require unprecedented amounts of water to extract the oil. In the case of the Alberta oil sands, there simply isn't enough water anywhere near the oilfields to process more than a very small fraction of the oil every year. The conventional view in the oil industry is that the oil sands are within our reach.

The oil market – now pushing at unprecedented price levels of more than $80 a barrel – is giving a clear signal. Clearly, short-term traders see no relief in sight to the extremely tight world oil market.

Where is the climate change angle?

The International Energy Agency sees total world energy demand growing by over 50% by 2030, with greenhouse gas output rising by a slightly larger figure. A new forecast is due in the next few days and the rumour mill is suggesting that the IEA will increase its projections for 2030, throwing climate change worriers into deeper gloom.

The IEA sees oil output rising slightly less fast than energy use as a whole. Oil use is expected to rise by about 35% by 2030. Of course, if the Peak Oil people are right, emissions from the burning of oil are likely to stabilise or fall. This looks like good news for the atmosphere. It is actually more complex than might appear:

- If the Peak Oil hypothesis is right, we can expect further huge increases in the price of oil. True, this will add to the incentive to extract every last barrel from depleted fields. But it will not alter the fact that no large fields remain. So the high price of oil will not be followed by a surge in new supply.
- High oil prices haven't yet restrained consumption of oil by any significant amount. US oil purchases have continued to rise even as the price spikes. The rest of the industrial world, partly protected by the fall in the dollar, has seen growth rates not dissimilar to GNP growth rates. All the evidence is that the demand for liquid fuels is extremely price inelastic. After all, there is no easy substitute for petrol or diesel.
- So the price may stay high. Many countries subsidise fuel prices, or hold them down through regulation. The recent Burmese riots were driven partly by increases in the price of fuels. Higher fuel prices threaten social stability, even in oil-producing countries. In Iraq, for example, higher oil prices aren't getting transferred to the urban poor in the form of higher incomes. But they are feeling the impact at the petrol pump. High oil prices mostly benefit the elites. Eventually the poor will revolt, possibly threatening the supply of oil to the outside world. If Iran were to collapse because of uprisings from the urban masses, world oil prices would go yet higher.
- Paradoxically, perhaps, this isn't good news for climate change. Increasing transport fuel prices increase the incentive to convert other fossil fuels into liquids. Coal can be turned into a motor spirit. It is only economic at high oil prices, but it is perfectly technically feasible. The Nazis and the boycotted South Africans did it. It is extremely greenhouse gas intensive – probably doubling the climate change cost of a litre of fuel.
- Second, high petrol prices will encourage states to develop crash programmes for biofuels. Temperate biofuels save only a small amount of fossil fuel, since so much energy needs to go into fertilisers and processing the biomass. So the emphasis is likely to be on tropical biofuels. We can expect to see faster and faster rates of deforestation as land is cleared for grains and oil plants. The net effect of this deforestation is disastrous for CO2 emissions as the felled trees give up their sequestered carbon to the atmosphere.
- The third major impact of very high oil prices is on the viability of extracting oil from unconventional sources. The world's shales and oil sands hold large volumes of oil – perhaps as much as remains in conventional fields. In Alberta, development may be held back by a shortage of water, but any processing of oil sands uses large amounts of energy (largely to produce hydrogen for a chemical reaction to upgrade the oil and make it usable). Extracting oil from sands makes the carbon cost of the oil at least as bad as coal and significantly worse than conventional oil.

The net effect of the continued high oil prices expected by the Peak Oil gang is difficult to predict. The impact may be to hold down world growth, and thus restrain emissions. But it is at least possible that the dominant implication of high oil costs is huge CO2 outputs from processes that turn other fossil fuels into usable liquids. Am I being too pessimistic? Possibly. But the Princeton academics (Socolow and Pacala) who popularised the idea of 'wedges' of increased carbon emissions have recently included the conversion of coal to liquid fuels to their list of forces tending to increase global emissions. According to Socolow and Pacala, the large South African synthetic fuel plant is the largest single point of CO2 emissions in the world. The game they have invented for schools envisages 180 similar plants over the next decades. This leads one to the conclusion that these highly respected academics do not think that Peak Oil will be good for climate change.

(Those interested in reading more on the Peak Oil issue should read David Strahan's superb 2007 book *The Last Oil Shock*.)

Video conferencing: at last a good alternative to travel?

Video conferencing has been around for a surprisingly long time. AT&T ran the first call in 1927. Since then, pundits have been consistently predicting that video conferencing was just about to take off. They have been wrong for eighty years. Why should we believe the techno-optimists now?

In the last year, several companies have launched video conferencing products that provide an experience similar to real meetings. The quality is surprising and even sceptics have begun to see the advantages of using a meeting room for an hour rather than spending three days going to Hong Kong and back. Cisco's Telepresence product is generating enthusiasm that is tempered by the enormous costs of setting up the equipment and providing the bandwidth. But the company says that prices will fall dramatically over the next few years.

Is this going to be enough to get people out of planes? The signs are good. Even low bandwidth alternatives suitable for home use are getting praise from the experts. So if Cisco doesn't make video conferencing work, Bay Area start-ups like VSee will probably start eating into the market for lower cost products.

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Video conferencing: why we need it to work

UK companies are increasingly promising 'carbon neutrality' to their stakeholders. Electricity consumption can be neutralised by the purchase of energy from renewable sources. Gas is more difficult to counter-balance, but is a small element in most firms' carbon emissions.

Carbon produced by travel is an increasingly important part of the budget of most large companies. Amongst the very largest companies, business flights dominate the total emissions from employee travel. And as air travel is perceived to get more time-consuming, stressful and unproductive, some companies are beginning to investigate much more extensive use of video conferencing. Other than investing in dubious 'offsetting' projects, video conferencing may be the most plausible way of beginning to hold down the apparently inexorable rise in air travel.

The previous generation of video conferencing products are widely regarded as wholly unsuitable replacements for meetings. The experience seems to be that only groups well know to each other with similar professional

backgrounds can work around the deficiencies in older conferencing products. The new generation of video conferencing, universally called ‘telepresence’, is clearly a huge advance on the old systems. First reports from companies that have installed the expensive technology are extremely favourable. The computing press reports a Wachovia bank executive saying that telepresence suites were already in use 45% of the time within two months of installation. The previous kit had never got above 20%. Tate and Lyle is quoted as saying that the new service makes good financial sense because the typical trip between the UK and US headquarters costs $25,000 and three days of senior executive time.

Video conferencing still has a long way to go. I have only found two large UK companies that report their hours of video conferencing use: Pearson and Reed Elsevier. Both companies are diversified publishing companies with widely dispersed operations and very high levels of air travel per employee. Pearson employees travel an average of 4,000 miles a year by air, down slightly last year but still rising at approximately 1% a year over a longer period. Air travel represents over two thirds of all business travel. The company used its video conferencing suites for a total of 9,000 hours last year, up significantly in 2006, but still a tiny fraction of the time spent travelling by air. The average employee spend less than 20 minutes in video conferencing last year. The time taken to travel the average 4,000 miles by air was probably the best part of a working week.

The air travel of Reed employees was up 5% last year, and accounted for 45,000 tonnes of emissions or about a tonne and a half per employee. Its advanced ‘collaboration’ suites saved about 323 tonnes, or less than 1% of the air travel figure.

We are not going to stop the need for international collaboration. The general quality of these collaborations is widely thought to be poor, largely because people don’t spend enough time together. The impulse to travel more and more will remain unless we can really get video conferencing to work.

The problems with video conferencing

One source describes working with another person over a video conferencing link as being similar to collaborating with a ‘mentally defective foreigner’. What goes wrong?

- Audio needs to be synched with video. But sound is easier to process and tends to arrive first. If the voice reaches the listener too early, the speaker tends to be perceived as untrustworthy and glib. If an adjustment is made to correct this and the video arrives first, the remote person is seen as stupid and slow-witted.
- Social protocols demand that people look at each other directly. A conferencing system that gives the user an impression that his or her interlocutor is looking more than 3 degrees away from the eyes will make the user uncomfortable, and give an impression of disrespect.
- Successful oral communication demands rapid and seamless switching between people in the conversation. Bad videoconferencing makes this more difficult than in an audio call.
- Most clues to the speaker that he or she is boring the audience, confusing them or patronising them are non-verbal. For example, few people actually say that a conversation bores them; they give subtle and not so subtle clues to their conversation partner. Video conferencing prompts the bored person to offer these clues, but they are not received by the other person. The speaker does not adjust his or her communication style. Irritation ensues.
- Similarly, people implicitly expect video conferencing technologies to make their speech persuasive (which is one of the reasons why one wants to speak face-to-face). It does not and everybody finds the interchange unsatisfactory.

In summary, bad video is worse than no video. The availability of a picture sets up an expectation that normal free-flowing conversation is going to take place. So both parties behave as if they were in a conventional face-to-face meeting, in which verbal and non-verbal clues are being unconsciously processed. A phone conversation would have been better because we would have adjusted to the well-understood restrictions on our communications ability.

What Cisco, Teliris, and others have done

Cisco’s telepresence product has been on the market for a year or so. Most users speak glowingly of its usefulness. Other products such as the one from Teliris also get enthusiastic reviews. People say that these new products both reduce travel and increase the number of meetings across geographically remote teams. If this first flush of success is maintained, we can hope that video conferencing will eventually reduce the need for business travel.

What are the key features of these products?

- Video conferencing takes place in a specially designed room. Each room around the world looks the same, even down to the wallpaper and light fittings. Each ‘side’ of a video conference has half an oval table – the other half is in the remote room.
- High definition plasma screens fill the opposite wall. Very clear images of the people in the other room are shown.

- Video and audio are precisely synched. People look directly at each other. The sound of speech comes from the direction of the other person. One set of user comments suggests that the Teliris product is better than the Cisco version because it gives equal visual 'weight' to people across the remote room while Cisco emphasises the centre of the screen.
- People are life-size.
- Video frame refresh rates are extremely high. Cisco mentions 30 new frames a second.
- Unusually for Cisco, it developed the technology internally. Cisco sees the product as an enhancement to its existing VoIP product. It has simply added video. This seems a strange comment, but Cisco was clearly determined to avoid the poor image of conventional video conferencing. It decided to sell the product as in some sense an enhancement of its existing easy-to-use network VoIP offering.
- Cisco's product works over the corporation's existing data network (powered by Cisco routers, of course). Teleris offers users its own data network.

The costs are intimidating. To prepare a full room, with several plasma screens on the remote wall, Cisco charge $300,000 (and the same for the other end). A much more restricted product with just one screen sells for $80,000. The monthly cost is said to be '$3-5,000'.

All the evidence so far points to successful introductions of the new range of telepresence products, whether from Cisco, Teliris, HP or Tandberg. Data is scarce, but Teliris says that its customers added 50 rooms in the second quarter of this year.

What is going to happen to the costs in the future? Cisco claims that good telepresence products will eventually become viable in the home office. (CEO John Chambers already has one at home.) We expect outrageous techno-optimism from Cisco, and this looks a little on the unrealistic side. Others say that the cost will never fall below $10,000 a room. At this level, it may not make sense for many home workers, but for a senior executive it seems perfectly possible that he or she will eventually equip a room. Bandwidth may be a more intractable issue.

Early results on the sociology of use

One large bank I spoke to said that the telepresence room was in high demand, and much liked by those who used it. The bank was seeing demand from people who didn't really need the video element of the conversation and was restricting its use to the most senior executives. A board meeting had taken place via telepresence with one senior member calling in from London, thus avoiding a long international flight. These signs look good – if the heavy hitters want to stop the middle ranks from using the rooms, there is clearly a high status attached to making a video call. If a board meeting can take place in the rooms, we can see this as a further endorsement of its acceptability for important discussions. But true success will only come when the senior investment bankers get a new deal mandate via telepresence. Then the barriers really will come down.

Other anecdotal material suggests that exposing junior team members to each other via telepresence has had a good effect on trust and morale. Many international collaborations run into the sand because team members do not trust the other parties to deliver on what they promised. The possibility of holding every participant to account via a telepresence conversation seems to be improving productivity and providing a sense that people are genuinely working together.

The cheaper alternatives

Cisco and its competitors are focusing on offering a product that tries to replicate face-to-face meetings with as much fidelity as possible. Low latency life-size images are extremely expensive in bandwidth to transmit. Other companies such as VSee believe that we can solve the psychological problems with conventional video conferencing by understanding what really impedes communication. VSee says, for example, that we don't need high frame rates to offer real improvements over existing products. Cisco gives us 30 a second, but VSee says that only 5 is perfectly satisfactory, provided we get good synch between audio and video. Similarly VSee says that we don't need a life-size image to talk to, but we do need to offer the ability to look straight into the eye. By careful research into what really makes a video conversation work, VSee says it has hugely reduced bandwidth requirements. It has also incorporated true collaboration tools, such as 'laser pens' for PowerPoint presentations, that enable more immediate and compelling mutual understanding. VSee says it can operate effectively at conventional broadband speeds.

I don't know whether VSee will work: I couldn't find another user with whom to try out the product. But for close collaborators who know each other well, I suspect an intelligent product that works round the old problems with video conferencing can operate at surprisingly low data speeds. We won't always need a glossy room costing $300,000 for our conversations across the world.

Food packaging and climate change

A recent Henley Centre survey suggested that 86% of people were eager to buy goods with less packaging, up 20% in the last two years. Nothing arouses as much spontaneous anger among British householders as the 'over-packaging' of foods. Recent newspaper headlines conveyed righteous indignation about the policies of UK retailers, in particular the failure to make all packaging recyclable.

The newspapers completely missed the point. Three issues need to be emphasised:

- Food packaging is a vanishingly small fraction of UK waste. Waste food is far more important.
- Good packaging is vital: it helps protect food from damage and helps lengthen its shelf life.
- Recyclable food packaging may actually be bad for climate change.

Making these points too loudly can get you lynched in some middle-class areas of Britain. Nevertheless, it needs to be said repeatedly that packaging, particularly of food, is not the environmental disaster it is made out to be.

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The Local Government Association (LGA) represents the councils that are responsible for disposing of Britain's waste. Landfill taxes are rising and councils are also facing the threat of fines for not increasing the percentage of waste that is recycled.

The LGA commissioned a survey to look at the total amount of food packaging and the percentage that is recyclable. The survey was part of its campaign to reduce the amount of waste its councils handle, and to increase the recyclable percentage of what remains.

It survey showed that:

- About 5% of the weight of a basket of supermarket goods is packaging.
- About 60% of this packaging was 'recyclable', largely because it is made from paper, card, glass or steel. Plastic bottles are also recyclable.

The LGA used the results of this survey to criticise food retailers and to demand that the supermarkets reduced their packaging of food. This request is misplaced – it should have focused more on getting households not to waste food, and to carry out good quality composting at home for any food that has to be thrown away.

The background: UK waste volumes

The total waste from all sources in the UK is about 335m tonnes, of which households dispose of about 30m tonnes. Therefore, only about 10% of the UK's waste comes from households. The most important source of waste is from building sites, which produce almost four times as much rubbish as UK homes. Similarly, a large coal-fired power station, such as Didcot, will produce more waste in the form of ash than all the households in the surrounding county of Oxfordshire. Domestic waste is highly visible but a relatively unimportant source of rubbish.

Packaging of all types represents about 5m tonnes of household waste. I calculate that the amount arising from food packaging is probably no more than about 1m tonnes, or about a third of 1% of the UK total. The weight of food packaging going into waste disposal is under 20kg per person per year. By contrast, food waste is almost certainly in excess of 6m tonnes or six times as much. For each person in the UK, 100kg of food waste is put into domestic rubbish containers each year.

The vast majority of food waste is then taken to landfill sites, although local authority food composting volumes are rising. Far more waste food than food packaging goes into landfill. And, as the next paragraphs say, food waste is far more of a climate problem than a few kilos of polythene film.

Waste disposal and climate change

Everything thrown away has used some energy in its manufacture. Minimising waste is a good way of minimising the use of energy and natural resources. No one argues for increasing the amount of waste going into the rubbish containers of UK households.

But the issues are very much more complex than suggested by the LGA report. Food going into landfill will gradually rot and in the absence of air will produce methane. Methane is a far worse global warming gas than CO2. Landfill sites are one of the worst sources of methane, although operators are getting increasingly good at capturing the gas and burning it for energy.

Anything that rots will turn into methane (eventually) in a landfill site. Plastic packaging is largely inert and will stay harmlessly in landfill for thousands of years. No one likes the idea of burying plastic waste, but this represents far less of a climate change issue than the disposal of rotting food. We also need to remember that putrescible food packaging (primarily paper and cardboard) will also rot to create methane if it is put in landfill. Plastic will not.

A few grams of plastic film has no measurable climate change impact, particularly when compared to waste food. Before demanding that more food packaging is recyclable, its advocates need to be sure that the vast majority of this packaging will be properly composted (in the case of paper and cardboard) or reprocessed (in the case of steel, aluminium or glass). 'Recyclable' packaging that will eventually rot in landfill is far worse for the climate than inert plastics. And, in addition, it may well take more energy to manufacture than a lightweight plastic.

The importance of food packaging
Packaged food lasts longer. INCPEN, a packaging industry trade association, quotes a study by the Cucumber Growers' Association which showed that 'unwrapped cucumbers are unsaleable after 3 days; just 1.5 grams of plastic wrapping (and 0.4 grams of paper label) keeps them fresh for 14 days and untouched by dirty hands'.

Packaged food is less likely to be damaged in transit from farm to shop and from there to the home. INCPEN says that 'a study that compared apples sold loose with four in a shrink-wrapped tray showed that there was 27% more waste (bruised apple and used packaging) from orchard to home from those sold loose'.

Food that doesn't last, or is damaged by the time it arrives home, is much more likely to be thrown into the rubbish bin and eventually find its way into landfill where it will eventually degrade into methane.

Let's estimate what the impact of this waste food is on climate change and then compare it with the impact of excess packaging. In my book *How to Live a Low-Carbon Life* I estimate that the food waste thrown by a typical individual into landfill probably creates over 200kg of greenhouse gases, or almost 2% of the individual's annual total. This is far more significant than the 20kg of food packaging typically thrown away each year.

What about the climate impact of making the packaging in the first place, compared to the food we eat? Once again, this debate is an unequal contest. Some foodstuffs, particularly meat and dairy, create more than ten times as much CO2 in their manufacture as they weigh. A kilo of beef may create 50 kilos during its production process, mostly because of the methane belched out by the animal as part of its digestive process. The total carbon emissions in the food packaging industry are probably little more than 10% of the food industry total.

The LGA's focus on food packaging is bizarre and unhelpful. It is far more important to get people to buy the food they need, and then to use it, than it is to remove a couple of kilos a year of packaging waste. This is where local government should focus its attention. One suspects that trying to get people to buy, cook and eat food carefully is a politically risky activity. It is far easier to take a few cheap shots at supermarkets.

News

Short comments on some of the major news stories from the last two weeks

Rising trends in atmospheric CO2

CO2 output is accelerating, the ocean and land sinks are getting less effective at absorbing it. So the rate of growth of carbon dioxide in the atmosphere is increasing.

(Canadell, Le Quéré, and others, 'Contributions to accelerating atmospheric CO2 growth from economic activity, carbon intensity, and efficiency of natural sinks', *Proceedings of the National Academy of Sciences*, 25 October 2007; URL: http://tinyurl.com/yqew8o [accessed 27 October 2007].)

The pre-industrial CO2 concentration in the atmosphere was about 280 parts per million. It was 381ppm in 2006. The growth rate between 2000 and 2006 was 1.93ppm, a significant increase on growth rates in earlier periods. Many policy-makers see it as vital to keep below concentrations of about 400ppm of CO2. The increase in the rate of rise of CO2 makes the achievement of this target more difficult.

Increases in the amount of CO2 in the atmosphere reflect the volume of global emissions and the effectiveness of the oceans and land mass in absorbing greenhouse gases. This paper contains evidence both that emissions growth is speeding up and that the greenhouse gas sinks are capturing less CO2.

The growth rate in emissions between 2000 and 2006 was 3.3% a year compared to 1.3% in the 1990s (please see the article on Chinese exports in this issue of Carbon Commentary for corroboration of this finding). This increase reflects fast economic growth, particularly in China and India and a worrying increase in the amount of CO2 produced per unit of global output. It cannot be stressed enough that this second cause of emissions growth is unexpected. We thought we were going to see energy use fall in relation to economic output.

By contrast, models have predicted a decline in the effectiveness of ocean CO2 'sinks'. This paper shows that we can have a strong suspicion (but not near certainty) that this process has started. The authors point to increasing wind speeds in the Southern Ocean as a primary cause. This turbulence 'ventilates' the carbon dioxide contained in the surface of the sea. Droughts in mid-latitude regions have contributed to the decreased efficiency of land absorption.

The paper concludes that – with large margins of error – economic growth generated 65% of the increase in atmospheric CO2; the decrease in the efficiency of the sinks generated another 18% and caused a rise in the carbon output required to generate a dollar of world GDP.

The authors summarise by saying that their results 'characterize a carbon cycle that is generating stronger-than-expected and sooner-than-expected climate forcing'.

The Soil Association and air freight

Only 1% of imported organic food comes by air. But the Soil Association says that air freight 'can generate 177 times' the CO2 of shipping. Air transport is necessary for some fruit and delicate vegetables which provide a vital source of income in some poor countries.

The Association was caught in a dilemma. It didn't want to give its valuable imprimatur to foods that caused climate damage but neither did it want to impoverish poor tropical communities.

It carried out a detailed and thoughtful consultation with stakeholders. It seems a model of its kind. The consultation produced a consensus that air freight was only acceptable if the products were farmed in a way that brought development to the local community. In essence the Association is saying that only 'Fairtrade' products will be able to carry its valuable label. It won't be enough just to meet the ordinary standards for organic agriculture.

Peter Melchett, the policy director of the Association, said that the 'results of our very widespread consultation show that most people in the North and the South say that they only support air freight if it delivers real environmental and social benefits. The linking of organic and ethical or Fairtrade standards does that'.

The Soil Association will now move to ratify this decision, which went against central government advice, at least as expressed in a recent speech by a minister.

In the same press release it also announced a move to involve the Carbon Trust in providing a 'footprint' for organic foods (please see the article on organic food and carbon emissions in Carbon Commentary Newsletter #1). It said it would move towards carbon labelling of organic foods (please see the article on Tesco and Wal-Mart in Carbon Commentary Newsletter #2 for reasons why we think this is a mistake).

In a slightly surprising move, it also announced that it would seek to 'actively encourage people to eat less meat'. Since beef cultivation is an important source of emissions, this makes good sense, but the Association is taking a risk by suggesting people should change their diet.

It also intends to review whether heated glasshouses are appropriate recipients of organic labels. This last point is well overdue. The carbon footprint of a food from a Dutch heated glasshouse is likely to be far greater than an air-freighted equivalent grown in the tropics.

BT's wind farm proposals

BT uses over half of 1% of the UK's electricity and is the single largest purchaser of green electricity in the UK. It buys over 10% of the country's total supply of renewable electricity. It now seeks to develop wind turbines on some

of its own sites. It intends to invest in about 120 2MW turbines to produce about a quarter of its own electricity or between 0.1 and 0.2% of the UK's total need.

This is an impressively large plan. The cost is about £250m. The financial return will depend on how much of the electricity replaces power BT would have bought from other suppliers and how much is 'exported'. Assuming very little is used by BT itself, the return will be approximately £50m a year, yielding a return of about 20% on the initial investment. These figures assume that BT gets a yield of about 28% of the rated capacity of the turbines, which is about the UK average.

These figures depend entirely on finding sites. I think that BT may well have substantial difficulties finding as many 120 places where it can capture enough wind to average 28%. Perhaps more importantly, at many of those sites which do have enough wind, I think it will have problems getting connections to the local distribution network. Two of the three initial sites identified by BT are in the Scottish Islands. Although a typical 2MW turbine is not a huge generator to add to the local network, the islands have quite limited electricity needs. Scottish and Southern may not easily be able to add these turbines to their network.

When I asked BT whether it had approached the local distribution companies to check on this point, I was not given an affirmative answer. This raises the possibility that BT announced these plans before detailed consideration of whether its aspirations are technically feasible. So it may be a great idea to erest wind turbines, but it looks like it will be much more difficult than BT realises. Companies like Ecotricity have been developing wind turbines on industrial sites for years. Though planning permission is easier, there are still huge obstacles to overcome. BT needs Ecotricity's expertise immediately, but it will still struggle to meet is aspirations to grow its wind power capacity.

Is Kyoto dead?

(Gwyn Prins and Steve Rayner, 'Time to ditch Kyoto', *Nature*, 449, 973-5 (25 October 2007); URL: http://tinyurl.com/ys8flx [accessed 27 October 2007].)

This short article has attracted attention around the world. Its thesis is that Kyoto is a dangerous distraction. It hasn't worked, and its successor will not succeed either if it follows the same principles. Kyoto's proponents have ignored its failures and exaggerated its effectiveness. It is worse than useless because it has stifled discussion of alternatives. However, their thesis is buttressed by two observations which are not accurate. They say that the International Energy Agency is predicting that world energy demand will double by 2030. It does not; it predicts a rise of just over 50%. Second, the paper states that the BP annual Statistical Review says that a likely global carbon price will not be high enough to induce major change. It does not; BP might think this, but its latest Statistical Review (referenced in the text) does not say this.

Like generals fighting the previous war, Kyoto's originators based its design on the successful treaties on ozone depletion, acid rain and nuclear weapons. These problems were much more amenable to global regulation and the sharing of burdens was much more politically feasible. The authors of this paper suggest that policy makers should move away from treaties that try to put a cap on world emissions.

Prins and Rayner say that we need new techniques for getting a grip on the carbon problem. And, second, we need to work out how we need to adapt when severe climate changes arrive.

Their proposals for replacements for Kyoto are short and unspecific. In summary, they believe that the world needs 'genuine' emissions markets, not artificial constructs like Kyoto, and these markets must evolve gradually from local experiments. They mention approvingly some of the voluntary carbon markets that have grown up in the US. I think this faith in small informal markets is wholly misplaced. What possible reason would persuade a major polluter to participate?

The authors tell us we need to invest more in public R+D in clean technologies. In this they mirror Bjørn Lomborg (see the discussion of his book *Cool It* in Carbon Commentary Newsletter #3). They support messy public policies rather than ones that go for what they disparagingly describe as 'elegant' solutions. They see a role for measures such as mandatory technology standards (perhaps such as mile per gallon regulation on cars). The ideas they present are sketchy and unconvincing.

Many of us think that Kyoto and its successor are worth supporting as one of a package of measures. It is, after all, the only measure that we have currently got other than European ETS. Does it distract from finding other tools? I don't see any evidence for the authors' pessimism. Can it be merged with other global and local measures? Yes it can. No one pretends Kyoto is perfect, but because it tried to distribute the pain of emissions reduction reasonably fairly, it was a start. We can build on it; we need not destroy it.

E.ON and tidal stream technology

It is adventurous of E.ON to decide to invest in tidal stream generator farm. The announcement in the last few days confirmed that the company intended to put a tidal plant off the coast of Wales in a partnership with Lunar Energy.

The Severn barrage scheme (see Carbon Commentary Newsletter #3) is a 'tidal range' scheme. The electricity is generated by damming the river at high tide and then letting the water flow out through turbines as the tide falls. Tidal stream technology captures the energy of the tide as it flows through constricted channels. The UK has many potential sites for tidal stream power stations, but the best locations are off the north coast of Scotland and around Alderney in the Channel Islands.

Why then has E.ON chosen Wales? Perhaps the company doesn't want to test the technology in the toughest conditions. An attempt to use similar underwater turbines in New York's East River has been frustrated by the breaking off of the tips of the turbine blades in the fast flowing tides. The UK's offshore conditions will be far tougher. Or it might be that E.ON knows that it would be expensive or impossible to connect the turbines to the distribution grid in the locations of highest energy potential (see the news story in this section on BT's plans for wind turbines in Orkney and Shetland). Previous rumours have suggested that the eventual site chosen will either be off the coast of Pembrokeshire or off Anglesey.

The recent report into the Severn barrage noted that there at least 24 different technologies for capturing tidal stream energy in the UK. The device promoted by Lunar Energy sits on the sea floor, is about 20m long and has a turbine diameter of about 12m. The blades sit within a case which focuses the tidal flow. As a Venturi device, the speed of the water flow within the case is greater than the flow outside, adding to the amount of energy that can be captured.

Is wave power economic? It is probably too early to say. The UK has excellent tidal streams around the country, but even this advantage may not be enough. Lunar Energy optimistically quotes figures of around 2.5p to 5p per kilowatt hour, which would make the technology extremely attractive, but these figures appear only to be based on some guesses made in the US. The Carbon Trust's recent report suggested figures at least three times as much for the first implementations of tidal stream power plants. On the other hand, informal figures from the New York project have suggested figures close to the Lunar Energy estimates.

E.ON has been working with Lunar Energy for some time. It had been thought that the generator would not commit until after sea trials of the first Lunar device in Scotland next year. Last week's announcement suggests that E.ON's confidence in the technology and Lunar Energy is high.

Companies mentioned in this newsletter: Innocent, NatureWorks, AT&T, Cisco, VSee, Wachovia, Tate and Lyle, Pearson, Reed Elsevier, Teliris, BT, E.ON, Lunar Energy.